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Aircraft Access to SWIM

T04D01: AAtS Requirements Document

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Booz | Allen | Hamilton

8255 Greensboro Drive

McLean, VA 22102

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1 Introduction

1.1 Purpose

The purpose of this document is to identify the Federal Aviation Administration (FAA) actions and responsibilities needed to:

- Define and evaluate the Aircraft Access to SWIM (AAtS) concept where SWIM refers to the System Wide Information Management initiative.
- Establish the desired AAtS functionality
- Operate the AAtS NAS-to-AAtS user data flow capability once it is established

This document is also designed to provide a vision of the planned AAtS functionality, and the requirements for developing it, for the aviation community.

1.2 Scope

The AAtS initiative has two dimensions. First, the FAA will give defined SWIM-supported National Airspace System (NAS) data to approved AAtS vendors via the NAS Enterprise Security Gateway (NESG). The AAtS vendors, via their AAtS vendor Data Management System (DMS) software products, will then provide the NAS data to AAtS users to include aircraft. Second, AAtS will enable the flow of data from aircraft, and its flight crew, to the FAA via the AAtS vendor DMS software products. This part of the AAtS capability will provide aircraft generated and observed data to the FAA who, in turn, will use it to improve NAS capacity, safety and efficiency. Both dimensions of AAtS will be implemented as soon as the required SWIM and NESG functionality is available to the AAtS program.

This document addresses the initial planning, program, and operational system requirements associated with the flow of NAS data to AAtS users. The requirements identify the actions and decisions needed for AAtS-related research, cost/benefit assessments, development, deployment, and eventually operation of the envisioned AAtS functionality. Requirements for the second part of the initiative, the aircraft-to-FAA data flow, will be addressed in subsequent efforts.

While AAtS involves a cooperative FAA and private sector effort, the focus of this document is FAA-based requirements. At a high level of extraction, this includes:

- Establishing the AAtS functionality

- Providing the appropriate SWIM-supported NAS data to approved AAtS vendors

In addition, at the request of the FAA sponsors, this document includes illustrative operational requirements for all AAtS participants that are based on the scenarios provided in the AAtS Concept of Use (CONUSE) document.

In general, with the exception of the mentioned illustrative requirements, commercial partner-based functions, activities, and requirements are considered to be out of scope and are excluded from this document.

1.3 AAtS Overview

The FAA Next Generation Air Transportation System (NextGen) Implementation Plan includes a NextGen System Development Project called New ATM Requirements that describes the need for an airborne component of the SWIM Service-Oriented Architecture (SOA). AAtS will meet this requirement by providing a two-way connection between aircraft and the NAS SOA platform being implemented by SWIM.

AAtS will provide access to timely and consistent NAS data currently not available to the flight crew. It also will enable FAA to receive aircraft-generated and observed data. Data available through AAtS will not be used to provide mission-critical data or command and control applications.

Providing consistent and current NAS data to targeted users will increase situational awareness by improving the information available to the flight crew on:

- Air Traffic Management (ATM) activity
- Traffic Management Initiatives (TMIs)
- Traffic along a route of flight
- Departure and destination airport operations
- Weather
- Changes in relevant NAS infrastructure
- Other activity that potentially could affect aircraft operations.

Providing NAS performance data, delay data, and other decision-making information to the aircraft will enable the flight crew to respond to and avoid constrained areas in the NAS. The true gate-to-gate collaborative flight planning will reduce the impact of excessive demand and to the benefit of the flight, other airspace users, and the entire NAS.

AAtS represents a FAA-private sector venture whereby the FAA will provide defined NAS data to approved AAtS vendors who will process and provide,

typically by reselling, the data to subscribed users. The AAtS data will be provided to users via approved, commercially developed, AAtS vendor DMS software products. The AAtS capability is linked to, and dependent on the availability of, the SWIM functionality.

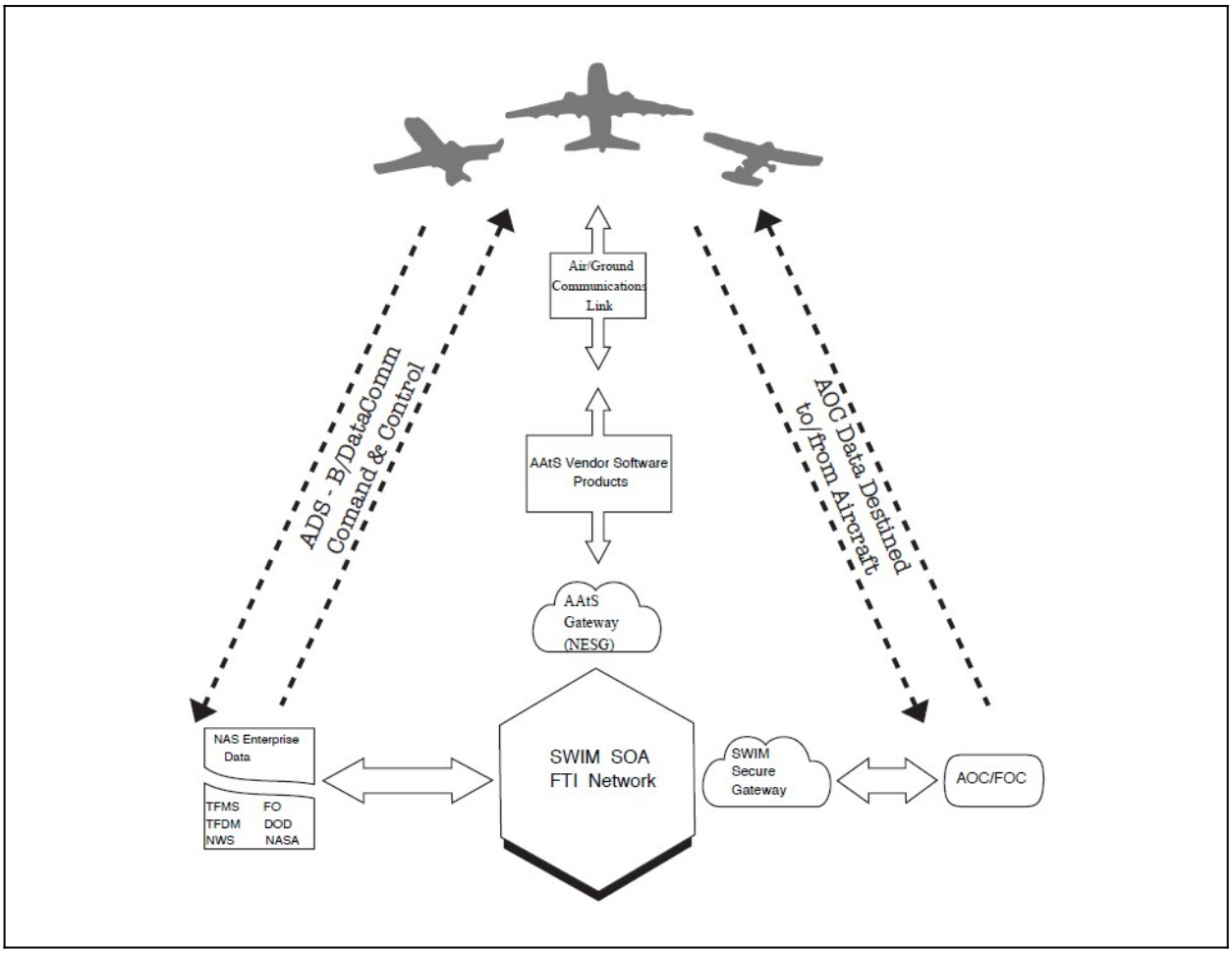
The four parts of the envisioned AAtS capability are the:

- AAtS Gateway (NESG) by which the FAA will provide NAS data to authorized users
- Defined NAS data the FAA will give to approved AAtS vendors
- Approved AAtS vendor commercial DMS software products that will receive the FAA NAS data, convert it into useful information, and provide it to AAtS users who purchase the AAtS vendor software product or service
- Aircraft-generated data the FAA will receive via the AAtS initiative

Note that the FAA has prime responsibility for the first two items. The AAtS commercial partners (the AAtS Vendors and their AAtS Users) have prime responsibility for the third item. Responsibility for the fourth item is shared between the FAA and the commercial partners.

Figure 1 depicts the vision for the AAtS capability. The figure illustrates the planned complementary relationship between AAtS-provided data with the operational and mission critical data already provided to aircraft via other communication technologies such as Automatic Dependent Surveillance – Broadcast (ADS-B) and Data Communications (Data Comm). It also captures the flow of data from the aircraft to the FAA planned for the implemented AAtS functionality. While not shown in the figure, some AAtS vendor DMS software products may also have direct linkages with Aircraft Operations Centers (AOCs) and/or Flight Operations Centers (FOCs).

Figure 1: Notional AAtS Architecture



As envisioned the FAA will provide the following types of NAS data to AAtS users:

- ATM data such as near-real-time information regarding aircraft flight plans, schedules, user preferred routes, TMIs, traffic demands and forecasts, airport capacities and delays
- Weather data such as forecasted and reported meteorological conditions and weather advisories
- Aeronautical data such as information on the operation of the NAS infrastructure (e.g. navigational aid [NAVAID] and equipment status, Notices to Airmen [NOTAMs], Special Activity Airspace [SAA], and Temporary Flight Restrictions [TFRs])
- Safety and security data (While not yet fully defined or specified SWIM will support the ASIAS [Aviation Safety Information and Sharing] system)

1.4 AAtS Mission Need Statement

This section addresses the need for the flow of NAS data to the aircraft and all AAtS users. Consistent with the document focus, the section does not address the need or value of the aircraft-to-FAA data flow, which will be addressed in subsequent documents.

Currently, in the NAS operational environment, aircraft flight decks can receive NAS data and information via one or more of the following mechanisms:

- Two-way communications with air traffic controllers (This is the most common mechanism but some information provided falls under the additional services category. Examples include Airmen Meteorological Information [AIRMET] and Significant Meteorological Information [SIGMET].)
- On-board weather radar (range 50 to 150 nautical miles [nm] with limited detail)
- Two-way company radios/communications with the AOC/FOC
- Information delivered to commercial aircraft cockpits via data link (e.g., Aircraft Communications Addressing and Reporting Systems [ACARS])
- Information gained by monitoring other pilot-controller communications

Typically, flight crews operate with only a partial and incomplete picture of the NAS environment. Most of the information transferred to the flight deck is via voice communication and often the aircraft must rely on static information provided before departure. General weather forecasts, NAS constraints, and in place TMIs can be hours old they are reviewed in flight by the flight crew. As a result, without dynamic updates, a flight crew is often unaware of upcoming traffic management programs or delays because of weather.

Old and out of date information in the aircraft leads to uneven knowledge among cockpit crews, traffic management, controllers, and AOC/FOCs. This contributes to inefficient planning, excessive time lapses, a need for additional communication (to compensate for the quality and timeliness of information) and lower flight crew situational awareness levels.

Several constraints hinder the timely flow of useful information to the aircraft. These include:

- Lack of a consolidated data source for all available aviation-related information
- Lack of ground-to-air channel for pilots to obtain shared NAS services and information
- Reliance on voice communications for in-flight aviation
- Limited access to NAS information and services

The inability to distribute NAS information in a timely fashion reduces the scope of planning and narrows the ability of all users to make dynamic, strategic decisions. The net result is reduced NAS operational agility. There is an operational need, addressed by the AAtS initiative, to address and reduce the impact of these constraints on NAS operations.

AAtS will provide aircraft with a means to connect to a common collection of aeronautical services provided from multiple sources including the FAA, DHS, airports, and other information services. FAA does not intent to implement a specific infrastructure to create the actual link to the aircraft but will define a FAA-based set of operational and technical requirements that will be used to drive that infrastructure.

1.4.1 Assumptions

The AAtS assumptions are as follows:

1.4.2.1 SWIM and the NESG will be operational and available to support AAtS connections, security, data, and data services requirements.

1.4.2.2 The FAA AAtS connection for SWIM services will be provided at the NESG.

1.4.2.3 A version of the NAS Service Registry/Repository (NSRR) will be publically available to enable a prospective AAtS vendor provider to determine whether it wants to connect to SWIM.

1.4.2.4 The AAtS connection to AAtS users will be provided through FAA-approved private third party providers (AAtS vendors).

1.4.2.5 AAtS vendors will collectively form a single class of SWIM-supported NAS data consumers. (That is, all approved AAtS vendors will have the data access rights and privileges.)

1.4.2.6 Approved AAtS vendors and users will be required to develop their own interfaces for AAtS through a commercial air/ground (A/G) network services provider’s infrastructure.

1.4.2.7 AAtS data will be available, via AAtS vendor DMS software products, to support all aviation subscribers to include commercial air carrier operations, military, corporate and general aviation (GA).

1.4.2.8 AAtS system will enable the flight crew to obtain real time update for specific NAS elements, e.g. an airport ID “ORD” (Chicago O'Hare International Airport) a facility “ZAU” (Chicago Center) may return all input on Chicago Center. If a NOTAM for ORD was published the flight crew may receive notification of the change.

1.4.2.9 AAtS supported services will provide non-critical information to flight crews that is intended for advisory purposes and not for command and control. (AAtS information will not interfere with avionics essential to the trajectory and safety of flight e.g., Flight Management System [FMS]).

1.4.2.10 AAtS is largely “network agnostic.” However, the selected network must have sufficient bandwidth to support the desired services. Bandwidth and support depend on the AAtS vendors, and their AAtS users, to develop applications that meet commutation needs.

1.4.2.11 AAtS/SWIM/NESG enabled services, will be automated and “bi-directional,” providing information to the flight deck and sending flight information to ground based services, for example weather and flight condition data to weather (Wx) systems.

1.4.2.12 The NESG will include logic to automatically route messages to the correct AAtS vendor DMS software products based on embedded message information and business rules and provide security for proprietary data. The AAtS program will establish the address and content-based routing requirements as the AAtS concept matures.

1.4.2.13 As services are added to SWIM, they will be reviewed for AAtS suitability and utility.

1.4.2.14 The FAA and aviation community will collaboratively develop AAtS interface and integration requirements.

1.4.2.15 Use of AAtS vendor software products will meet all safety requirements for use in flight.

1.4.2.16 The FAA AAtS effort will insure that AAtS provides valid and timely NAS data to the approved AAtS vendor software products but AAtS will not monitor or specify the uses of the AAtS-provided data by the vendor software.

1.4.2.17 Regulatory elements of the FAA will insure that the AAtS vendor developed software products, and their delivery mechanisms, provide services and products to the aircraft that are appropriate, safe, and effective for the type of operation in which they are used. (For example, in a recent regulatory action, "Executive Jet Management proved the iPad was safe by putting it through rapid decompression at 51,000 feet. By contrast, private and corporate pilots are not required to go through the vigorous approval process as they are deemed responsible for deciding what is safe for use in their own cockpit.” Source: http://www.airlinenewsamericas.com/2011/07/faa-approves-use-of-apples-ipad-as.html)

1.4.2.18 The FAA will specify the data access control for SWIM-supported data provided by AAtS to AAtS users via the AAtS vendor DMS software products.

1.4.2.19 AAtS will only share non-proprietary data that is supported by SWIM and meets data access control requirements for the commercial airspace user sector

1.4.2.20 FAA will require that the AAtS software products provide FAA-specified aircraft-generated data to the FAA via the NESG.

1.4.2.21 The FAA will support three methods by which AAtS vendors to can connect to the NESG. The three supported methods are: the internet VPN; DTS-Serial Interface, and DTS- Ethernet. Since AAtS vendors will access multiple FAA/NAS systems, a separate IPSec tunnel will be provided for each accessed NAS system.

1.4.2 Issues and Constraints

- FAA has no plans to acquire systems, hardware, or software to directly support AAtS.
- AAtS depends on the availability of an operational SWIM and NESG functionality
- AAtS depends on the availability AAtS-needed NAS data via SWIM
- AAtS needs FAA-wide SWIM data access control policy for AAtS vendor DMS software products and AAtS users.

1.5 Methodology

1.5.1 Constructs and Terminology

The following terms, used in this document, are consistent with the "Aircraft Situation Display to Industry (ASDI): Functional Description and Interface Control Document for the XML Version" version 1.8 dated April 15, 2011.

- AATS vendor: commercial organization (outside of the FAA) that receives an AAtS data feed directly from the FAA. (Typically AAtS vendors resell the AAtS data to subscribed AAtS users.)
- AAtS user: organization that uses the AAtS data provided by an AAtS vendor. (Note: while AAtS vendors typically resell the data to AAtS users, an AAtS vendor could also be an AAtS user.)
- AAtS vendor DMS software products: commercially developed AAtS software tools that process the FAA-provided data and provide it to AAtS users

Other terminology used in the document includes:

- NAS Enterprise Security Gateway (NESG): the FAA interface with approved AAtS vendor software products and ability to assemble/give NAS data to vendor software.
- Approved AAtS vendor and/or AAtS vendor DMS software products: terms used to reflect the need for an ability to classify users and grant permissions based on defined classes or other user attributes

1.5.2 Requirements Determination Approach

The AAtS requirements development process started with a review of existing AAtS research studies, analysis reports, and discussions with the FAA client. The source materials, listed in the reference section of this document, provided a good researcher-based perspective of the desired and achievable AAtS functionality. Discussions with the FAA client provided insight on the intended scope and goals for the AAtS effort from the perspective of the FAA sponsoring activity.

The document reviews and discussions with the client allowed the requirements developers to generate a preliminary set of operational requirements. These requirements were documented in an initial requirements report that was provided to the FAA for review. The requirements were then revised based on the FAA client comments and

guidance. The revised requirements form the basis for the operational requirements presented in this document.

1.6 Organization of Document

- Section 1: Introduction – provides an overview of the AAtS initiative; discusses the AAtS scope, implementation, mission need, assumptions, constraints, and requirements determination approach; and lays out the organization of the overall requirements document.
- Section 2: AAtS Operational requirements - gives the requirements associated with AAtS Concept Analysis and Assessment, AAtS Data Specifications, AAtS Services and Processes, AAtS Operational Requirements, AAtS Performance and Standards. The section also includes illustrative CONUSE scenario-based operational requirements.
- Appendix A: References – lists the references considered and used in generating the AAtS materials discussed in this document.
- Appendix B: Shortfalls, Engineering Needs and AAtS benefits - summarizes the expected AAtS benefits and the shortfalls that AAtS addresses
- Appendix C: AAtS Concept of Use Scenarios
- Appendix D: Acronyms

2 Operational and Technical Requirements

The requirements in this section focus on the FAA-based activities, processes, and capabilities needed to define, develop, and operate/achieve the envisioned AAtS functionality. In addition, section 2.6 provides illustrative AAtS CONUSE scenario-based requirements for private sector AAtS users, AAtS DMS providers, and operational FAA participants.

2.1 AAtS Concept Analysis and Assessment

The requirements in this section address the FAA-based actions needed to develop, quantify, and evaluate the desired AAtS capability.

2.1.1 The FAA shall assess the potential value of the AAtS functionality to the overall air traffic community. (Note: the assessment approach could involve industry days, surveys and/or demonstrations.)

2.1.2 The FAA shall assess the air traffic user community interest in the AAtS functionality. (Note: the assessment approach could involve industry days, surveys and/or demonstrations.)

2.1.3 The FAA shall assess the potential cost and benefits of the AAtS functionality.

2.1.4 The FAA shall identify the potential air traffic user community uses of the AAtS provided data.

2.1.5 The FAA shall specify the SWIM-supported source data systems that will provide data via AAtS.

2.1.6 The FAA shall assess the availability of the technology and infrastructure needed for AAtS and establish a possible timeline for deploying the AAtS functionality.

2.1.7 The FAA shall identify all the regulatory documents that apply and would be affected by the movement of the AAtS data and delivery mechanisms to aircraft.

2.1.8 The FAA shall determine, based on planning assessments and analyses, whether to implement the AAtS functionality

2.2 AAtS Data Specifications

The requirements in this section identify the NAS data-related specifications needed to realize the AAtS capability.

2.2.1 The FAA shall specify, for each SWIM-supported data source, the data elements that will be provided via AAtS.

2.2.2 The FAA shall specify the data access controls for every data element provided via AAtS.

2.2.3 The FAA (SWIM) shall specify the format requirements for every data element provided via AAtS.

2.2.4 The FAA (source data systems) shall specify the update cycle options.

2.2.5 The FAA shall specify the AAtS vendor subscription options and requirements.

2.3 AAtS Services and Processes

The requirements in this section address the FAA-based actions and services needed to achieve and provide the AAtS capability.

2.3.1: The FAA shall decouple, and address separately network versus services connections.

Notes:

Note 1: AAtS DMS providers will receive data from a number of SWIM-supported data sources.

Note 2: “Currently the NESG combines the connection of network and services. This requirement is needed to preserve the concept of decoupled services in the service oriented architecture environment. It encompasses all the current required forms for connecting (network and service) to the gateway, agreements, MOAs, ITS, security controls, interoperability testing, and configuration and will address the network connection and service connections separately.”

Note 3: Changes to the NESG connection and service provision approach will likely cause revisions to the FAA Telecommunications Infrastructure (FTI) Enterprise Security Gateway User’s Guide

2.3.2 FAA shall allow approved AAtS DMS providers to register for services via the NAS Service Registry/Repository (NSRR).

2.3.3 FAA shall insure that AAtS DMS providers' connections to the NESG satisfy the requirements specified the updated FTI Enterprise Security Gateway User's Guide for Non-NAS users.

2.3.4 FAA shall insure that AAtS vendor testing does not impact on any NAS system or on SWIM.

2.3.5 The FAA shall establish methods/processes to certify and approve AAtS DMS providers and their AAtS vendor software products connection to the NESG.

2.3.6 The FAA shall specify and establish the AAtS supported publish/subscribe messaging functionally.

2.3.7 The FAA shall specify the NESG and vendor software product capabilities required to transmit and receive message delivery acknowledgments.

2.3.8 The FAA shall specify the computing platform requirements (to include computer architecture; operating system; and, related runtime libraries or graphic user interfaces) for linking to the NESG.

2.3.9 The FAA shall establish processes and procedures to review and approve the use of AAtS vendor generated mechanisms to provide AAtS data to aircraft.

2.3.10 Established FAA (SWIM/NESG) services shall address AAtS service access levels, security, and capacity requirements. (See SWIM Governance Policies, version 1.1, sec 4.4.1 paragraph 2)

2.3.11 The FAA shall establish mechanisms by which AAtS users can discover, and gain access to, new SWIM-supported NAS data and services. (See SWIM Governance Policies, version 1.1, sec 4.4.1 paragraph 2)

2.3.12 FAA shall provide guidance to perspective AAtS DMS providers on how to connect, register and consume AAtS-based services through SWIM.

2.4 Operational Requirements

The requirements in this section address the FAA-based actions and processes needed to implement and provide the AAtS capability.

2.41 The FAA shall establish AAtS approval processes needed to provide test data to AAtS DMS providers for AAtS vendor software product development.

2.4.2 The FAA shall establish a memorandum of agreement (or a similar type of document) with each AAtS vendor that identifies use constraints for AAtS-provided data (i.e. permissible and prohibited activities).

2.4.3 The FAA shall give AAtS DMS providers the information needed to receive and interpret the AAtS data feed(s).

2.4.4 The FAA shall uniquely identify all AAtS DMS providers. (See SWIM Final Program Requirements for Segment 1 revision 7.3, requirement 7.2.4.1)

2.4.5 The NESG shall authenticate the connection with approved AAtS vendor software products. (See SWIM Final Program Requirements for Segment 1 revision 7.3, requirement 7.2.4.2)

2.4.6 The FAA shall establish the class of authorized users of AAtS provided data.

2.4.7 SWIM-supported source data systems shall register AAtS DMS providers with member identifications and data access controls. (See SWIM Final Program Requirements for Segment 1 revision 7.3, requirement 3.1.3.1.1)

2.4.8 SWIM shall grant AAtS DMS providers access to all approved SWIM services, transactions, and information in accordance with AAtS member identification and access privileges. (See SWIM Final Program Requirements for Segment 1 revision 7.3, requirement 3.1.3.1.2)

2.4.9 The NESG shall read and retain subscriptions for approved AAtS vendor software products.

2.4.10 The FAA (SWIM and the NESG) shall stream the SWIM-supported AAtS data to approved AAtS vendor software products based on subscriptions and access controls.

2.4.11 The FAA (SWIM) shall establish run-time security controls (to include those focused on authorization-based access to data and services) of AAtS data consumers. (See SWIM Governance Policies, version 1.1, sec 4.4.1, paragraph 2)

2.4.12 AAtS shall establish Service Level Agreements (SLAs) and policy contracts between the AAtS user class and each SWIM-source system providing data via AAtS. (See SWIM Governance Policies, version 1.1, sec 4.9.2, paragraph 1)

2.5 Performance and Standards

The requirements in this section address the performance and standards needed for the operational AAtS capability.

2.5.1 The FAA shall establish the criteria authorized AAtS DMS providers must meet to receive AAtS data.

2.5.2 The FAA shall establish standards required for AAtS software interfaces, hardware interfaces, and security for NESG - AAtS vendor software products connections.

2.5.3 The FAA shall specify AAtS required performance levels for message accuracy, integrity, security, and reliability.

2.5.4 The FAA shall specify the capability levels required to administer, monitor, and enforce FAA and AAtS-specific services security policies. (See SWIM Final Program Requirements for Segment 1 revision 7.3, sec 2.1. paragraph 5)

2.5.5 The FAA shall establish Service Level Agreements (SLAs) that address available services, performance monitoring, reporting, and compliance requirements. (See SWIM Governance Policies, version 1.1, sec 4.9.2 paragraph 1)

2.5.6 The FAA shall specify AAtS fault monitoring and reporting requirements. (See SWIM Governance Policies, version 1.1, sec 5.3.2 paragraph 2)

2.5.7 The FAA shall specify AAtS vendor software products compatibility level requirements with SWIM servers.

2.5.8 The FAA shall specify the required NESG and vendor software product reliability, availability and maintainability levels.

2.5.9 The FAA shall ensure that all AAtS-associated products, services and interfaces meet or exceed the service availability provisions specified in section 3.3.1.1 (Service Availability) of NAS-RD-2025.

2.5.10 The FAA shall ensure that all AAtS-associated products, services and interfaces meet or exceed the service thread availability provisions specified in requirements 3.3.1.2.0-4, 0-5 and 0-6 of NAS-RD-2025.

The referenced NAS-RD-2025 requirements are as follows:
3.3.1.2.0-4: Routine Service threads shall have availability equal to or greater than .99.
3.3.1.2.0-5: The Mean Time to Restore for service thread components shall be less than or equal to 0.5 hours.
3.3.1.2.0-6: The Mean Time Between Failure for service threads with automatic recovery requirements and whose recovery time is greater or equal to the automatic recovery time shall be equal to or greater than 50,000 hours.

2.6 Illustrative User-based AAtS Requirements

The operational requirements provided in this section are keyed to, and consistent with, the four scenarios provided in the AAtS CONUSE. The requirements, while representative of the anticipated uses of AAtS, are illustrative since they assume that the scenarios are valid (will occur) and that the players in the scenarios will act as described in the scenarios. The requirements in this section, with their focus on the four CONUSE scenarios, do not address all the potential users or uses of AAtS.

The CONUSE scenarios that form the basis for the requirements in this section are provided for information in Appendix A of this document

Flight Crew-based User Requirements

The following illustrative CONUSE-based requirements focus on the flight crew.

2.6.1 The flight crew shall use the supplemental data provided by AAtS briefing prior to flight departure.

Note 1: As part of the clearance briefing and dispatch release requirements the flight crew typically addresses the following items:

- Review and confirm the following: The Aircraft ID (tail number of aircraft to be flown), Flight Number, Departure airport Destination airport (and alternate if required), type of operation (IFR/VFR), Review filed route of flight and altitude, Minimum fuel to conduct the flight, All Deferred maintenance items (DMI), Non-Airworthiness Items (NAI)

- Review current and forecasted weather for the filed route and the departure, arrival and alternate airport (if needed)
- Review NOTAMs for the departure airport, arrival airport, alternate airport, and enroute navigational equipment or items that may impact flight operations
- Review Aircraft load information and fuel burn in relation to the filed route and/or ATC approved route
- Tune in ATIS and receive current airport weather, runway in use, and any pertinent impacts at the airport
- Develop V speeds for departure
- Develop procedures for actions that may accrue during departure
- Contact the tower clearance delivery position for clearance or for the Pre-Departure Clearance (PDC) squawk code.

Note 2: Typically it is anticipated that the flight crew, prior to departure, will use AAtS functionality to:

- Check current and forecasted weather information for the departure, arrival, alternate airports and route of flight
- Check for NOTAMs at the arrival, departure alternate airport and enroute for items that may impact flight operations. This could be equipment outages, runway or taxiway closures, braking action, turbulence, PIREPs etc.
- Check for current and planned TMIs for departure airport, arrival airport and route of flight
- Check delay information for the departure airport, arrival airport, filed route of flight and/or the ATC approved route of flight
- Check for Advisories for departure airport, arrival airport and route of flight for possible delays or impacts to flight operations.
- Check the deicing status at departure airport
- Check the taxi times and status at departure and arrival airports
- Check the Operational Plans for the departure airport, arrival airport and route of flight
- Check arrival and departure rates at departure and arrival airports
- Automatically receive all updated information affecting the flight departure airport, route, and arrival airport (Including arrival and departure delays, forecasted or current weather changing during flight)

- Check aeronautical info (e.g. approaches) for arrival airport

2.6.2 The flight crew shall use the supplemental data provided by AAtS prior to, and in anticipation of, dialog with ramp control to request and receive clearance to push back from the gate.

Note: Typical anticipated flight crew uses of the AAtS functionality prior to, and in anticipation of, the push back dialog activities include:

- Review the anticipated taxi route
- Check weather at departure airport, arrival airport and route of flight
- Check the operational plan for possible delay or impacts at both the departure and arrival airports and review possible enroute impacts caused by weather or volume

2.6.3 The flight crew shall use the supplemental data provided by AAtS during the enroute phase of the flight.

Note: Typical anticipated flight crew uses of the AAtS functionality during the enroute phase activities include:

- Check PIREPs on flight conditions along the route
- Check for NOTAMs along the route and at the arrival airport
- Check TMI status along the route
- Check weather along the route
- Check status of arrival runways at arrival airport
- Check Advisories for the route of flight
- Check turbulence reports
- Obtain gate information for the arrival airport
- Review the Operational Plan for the arrival airport
- Check ATIS for the arrival airport
- Check for delays at the arrival airport and route of flight

2.6.4 The flight crew shall use the supplemental data provided by AAtS prior to, and in anticipation of, the flight descent/arrival.

Note 1: As part of the check list of descent/arrival activities the flight crew typically addresses the following items

- Check ATIS for current weather including: ceiling, visibility, wind, runway in use, current approach in use and any other items on the ATIS that may impact the operation
- Review, check and brief the planned arrival/approach procedures, fuel status, terrain, Ground Proximity Warning System (GPWS), Traffic Collision Avoidance System (TCAS) alerts, altitudes, approach speeds, crosswind component, and

the runway exit plan after landing and emergency/go-around procedures

Note 2: Typical anticipated flight crew uses of the AAtS functionality during the flight descent/arrival activities include:

- Review ATIS at arrival airport
- Review arrival WX.
- Check TMI status along the route
- Check for delays for the remainder of the route and at the arrival airport
- Check status at alternative arrival airports
- Check arrival runway status at arrival airport

2.6.5 The flight crew shall use the supplemental data provided by AAtS in anticipation of, and during, dialog with the arrival TRACON/tower.

Note: Typical anticipated flight crew uses of the AAtS functionality during the dialog with the TRACON/tower to obtain landing clearance activities include:

- Check TMI status at arrival airport
- Check for delays for the remainder of the route and at the arrival airport
- Check weather for arrival airport

AOC/FOC-based User Requirements

The following illustrative CONUSE-based requirements focus on the AOC/FOC.

2.6.6 AOC/FOCs shall use the AAtS information provided to the aircraft to improve situational awareness and decrease workload prior to departure.

Note: It is anticipated that AAtS will be used to provide NAS information to the flight crew about:

- Current or possible TMIs
- Information on delays for all the phases of the flight
- Integrated Collaborative Rerouting (ICR), ICR is a process where the ATCSCC identifies an impacted piece of airspace through a Flow Constrained Area (FCA) requesting the users reduce the volume.)
- Information on the status of departure delays before the A/C moves from the gate. (This will allow the flight crew to better

plan for departure to include pushing from gate and starting engine.)
- Information on the status of departure routes and causes of possible departure delays
- Information on taxi status and delays at the arrival airport
- Information on taxi status and delays at the arrival airport
- NAS Information in support of operational, business, and strategic planning activities.
- Route availability (via the Route Availability Procedures Tool [RAPT])

2.6.7 AOC/FOCs shall use the AAtS information provided to the aircraft to improve situational awareness and decrease workload during the enroute phase of a flight.

Note: It is anticipated that AAtS will be used to provide NAS information to the aircraft about:
- Current or possible TMIs
- Delays information for enroute and arrival phases of flight
- Integrated Collaborative Rerouting (ICR) information
- Real time access to PIREPs
- Route availability (via the Route Availability Procedures Tool [RAPT])
- NAS Information in support of operational, business, and strategic planning activities.

2.6.8 AOC/FOCs shall use the AAtS information provided to the aircraft to improve situational awareness and decrease workload during the arrival of a flight.

Note: It is anticipated that AAtS will be used to provide NAS information to the aircraft about:
- Information on system impact at the airport and possible delay information
- Information on arrival airport conditions
- NAS Information in support of operational, business, and strategic planning activities.

Air Traffic Management and Air Traffic Control-based User Requirements

The following illustrative CONUSE-based requirements focus on Air Traffic Management and Air Traffic Control-based AAtS participants.

2.6.9 ATCSCC Air Traffic Managers shall take advantage of AAtS to provide (broadcast) near real time expected and planned NAS status information to AAtS users, to include aircraft, during pre-flight parts of a flight.

Note: the types of activities anticipated include:

- Publish an increased number of advisories targeted toward aircraft users
- Publish advisories, targeted toward aircraft users, earlier
- Provide information on expected problems and potential TMIs to address them
- Provide information on possible reroutes
- Generate earlier and more complete TCA webpage entries
- Generate and provide earlier and more complete information in OIS webpages
- Generate and provide earlier and more complete information in operational plans and webpages
- Provide information on conditions and problems at NAS elements and airports

2.6.10 Tower/TRACON Air Traffic Managers and Air Traffic Controllers shall take advantage of AAtS to provide (broadcast) near real time expected and planned NAS status information to AAtS users, to include enroute aircraft.

Note: the types of activities anticipated include:

- Provide information to ATCSCC and thereby enable the publishing of an increased number of advisories targeted toward aircraft users
- Provide information to ATCSCC and thereby enable the publishing of advisories, targeted toward aircraft users, earlier
- Provide information on expected problems and potential TMIs to address them
- Provide information to ATCSCC and thereby enable the publishing of earlier and more complete TCA webpage entries
- Provide information to ATCSCC and thereby enable the publishing of earlier and more complete information in OIS webpages

- Provide information to ATCSCC and thereby enable the publishing of earlier and more complete information in operational plans and webpages
- Provide information on conditions and problems at NAS elements and airports

2.6.11 ARTCC Air Traffic Managers and Air Traffic Controllers shall take advantage of AAtS to provide (broadcast) near real time expected and planned NAS status information to AAtS users, to include enroute aircraft.

Note: the types of activities anticipated include:

- Provide information to ATCSCC and thereby enable the publishing of an increased number of advisories targeted toward aircraft users
- Provide information to ATCSCC and thereby enable the publishing of advisories, targeted toward aircraft users, earlier
- Provide information on expected problems and potential TMIs to address them
- Provide information on possible reroutes
- Provide information to ATCSCC and thereby enable the publishing of earlier and more complete TCA webpage entries
- Provide information to ATCSCC and thereby enable the publishing of earlier and more complete information in OIS webpages
- Provide information to ATCSCC and thereby enable the publishing of earlier and more complete information in operational plans and webpages
- Provide information on conditions and problems at NAS elements and airports

AAtS DMS providers-based User Requirements

The following illustrative CONUSE-based requirements focus on the AAtS DMS providers.

2.6.12 The AAtS DMS providers shall make the supplemental AAtS data available to the flight crew prior to flight departure.

Note 1: As part of the clearance briefing and dispatch release requirements the flight crew typically addresses the following items:

- Review and confirm the following: The Aircraft ID (tail number of aircraft to be flown), Flight Number, Departure airport Destination airport (and alternate if required), type of operation (IFR/VFR), Review filed route of flight and altitude, Minimum fuel to conduct the flight, All Deferred maintenance items (DMI), Non-Airworthiness Items (NAI)
- Review current and forecasted weather for the filed route and the departure, arrival and alternate airport (if needed)
- Review NOTAMs for the departure airport, arrival airport, alternate airport, and enroute navigational equipment or items that may impact flight operations
- Review Aircraft load information and fuel burn in relation to the filed route and/or ATC approved route
- Tune in ATIS and receive current airport weather, runway in use, and any pertinent impacts at the airport
- Develop V speeds for departure
- Develop procedures for actions that may accrue during departure
- Contact the tower clearance delivery position for clearance or for the Pre-Departure Clearance (PDC) squawk code.

Note 2: Typically it is anticipated that the flight crew, prior to departure, will use AAtS functionality to:

- Check current and forecasted weather information for the departure, arrival, alternate airports and route of flight
- Check for NOTAMs at the arrival, departure alternate airport and enroute for items that may impact flight operations. This could be equipment outages, runway or taxiway closures, braking action, turbulence, PIREPs etc.
- Check for current and planned TMIs for departure airport, arrival airport and route of flight
- Check delay information for the departure airport, arrival airport, filed route of flight and/or the ATC approved route of flight
- Check for Advisories for departure airport, arrival airport and route of flight for possible delays or impacts to flight operations.
- Check the deicing status at departure airport
- Check the taxi times and status at departure and arrival airports
- Check the Operational Plans for the departure airport, arrival airport and route of flight

- Check arrival and departure rates at departure and arrival airports
- Automatically receive all updated information affecting the flight departure airport, route, and arrival airport (Including arrival and departure delays, forecasted or current weather changing during flight)
- Check aeronautical info (e.g. approaches) for arrival airport

2.6.13 The AAtS DMS providers shall make the supplemental AAtS data available to the flight crew prior to, and in anticipation of, the flight crew's dialog with ramp control to request and receive clearance to push back from the gate.

Note: Typical anticipated flight crew uses of the AAtS functionality prior to, and in anticipation of, the push back dialog activities include:

- Review the anticipated taxi route
- Check weather at departure airport, arrival airport and route of flight
- Check the operational plan for possible delay or impacts at both the departure and arrival airports and review possible enroute impacts caused by weather or volume

2.6.14 The AAtS DMS providers shall make the supplemental AAtS data available to the flight crew during the enroute phase of the flight.

Note: Typical anticipated flight crew uses of the AAtS functionality during the enroute phase activities include:

- Check PIREPs on flight conditions along the route
- Check for NOTAMs along the route and at the arrival airport
- Check TMI status along the route
- Check weather along the route
- Check status of arrival runways at arrival airport
- Check Advisories for the route of flight
- Check turbulence reports
- Obtain gate information for the arrival airport
- Review the Operational Plan for the arrival airport
- Check ATIS for the arrival airport
- Check for delays at the arrival airport and route of flight

2.6.15 The AAtS DMS providers shall make the supplemental AAtS data available to the flight crew prior to, and in anticipation of, the flight descent/arrival.

Note 1: As part of the check list of descent/arrival activities the flight crew typically addresses the following items

- Check ATIS for current weather including: ceiling, visibility, wind, runway in use, current approach in use and any other items on the ATIS that may impact the operation
- Review, check and brief the planned arrival/approach procedures, fuel status, terrain, Ground Proximity Warning System (GPWS), Traffic Collision Avoidance System (TCAS) alerts, altitudes, approach speeds, crosswind component, and the runway exit plan after landing and emergency/go-around procedures

Note 2: Typical anticipated flight crew uses of the AAtS functionality during the flight descent/arrival activities include:

- Review ATIS at arrival airport
- Review arrival WX.
- Check TMI status along the route
- Check for delays for the remainder of the route and at the arrival airport
- Check status at alternative arrival airports
- Check arrival runway status at arrival airport

2.6.16 The AAtS DMS providers shall make the supplemental AAtS data available to the flight crew in anticipation of, and during, dialog with the arrival TRACON/tower.

Note: Typical anticipated flight crew uses of the AAtS functionality during the dialog with the TRACON/tower to obtain landing clearance activities include:

- Check TMI status at arrival airport
- Check for delays for the remainder of the route and at the arrival airport
- Check weather for arrival airport

2.6.17 The AAtS DMS providers shall make the supplemental AAtS data available to the AOC/FOCs to improve situational awareness and decrease workload prior to departure.

Note: It is anticipated that AAtS will be used to provide NAS information to the flight crew about:

- Current or possible TMIs
- Information on delays for all the phases of the flight

- Integrated Collaborative Rerouting (ICR), ICR is a process where the ATCSCC identifies an impacted piece of airspace through a Flow Constrained Area (FCA) requesting the users reduce the volume.)
- Information on the status of departure delays before the A/C moves from the gate. (This will allow the flight crew to better plan for departure to include pushing from gate and starting engine.)
- Information on the status of departure routes and causes of possible departure delays
- Information on taxi status and delays at the arrival airport
- Information on taxi status and delays at the arrival airport
- NAS Information in support of operational, business, and strategic planning activities.
- Route availability (via the Route Availability Procedures Tool [RAPT])

2.6.18 The AAtS DMS providers shall make the supplemental AAtS data available to the AOC/FOCs to improve situational awareness and decrease workload during the enroute phase of a flight.

Note: It is anticipated that AAtS will be used to provide NAS information to the aircraft about:

- Current or possible TMIs
- Delays information for enroute and arrival phases of flight
- Integrated Collaborative Rerouting (ICR) information
- Real time access to PIREPs
- Route availability (via the Route Availability Procedures Tool [RAPT])
- NAS Information in support of operational, business, and strategic planning activities.

2.6.19 The AAtS DMS providers shall make the supplemental AAtS data available to the AOC/FOCs to improve situational awareness and decrease workload during the arrival of a flight.

Note: It is anticipated that AAtS will be used to provide NAS information to the aircraft about:

- Information on system impact at the airport and possible delay information
- Information on arrival airport conditions
- NAS Information in support of operational, business, and strategic planning activities.

Appendix A – References

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Appendix B – Short Falls, Engineering Needs, and AAtS Benefits

Currently, in the current NAS operational environment, aircraft flight decks can receive NAS data and information via one or more of the following mechanisms:

- Two-way communications with air traffic controllers (This is the most common mechanism but some information provided falls under the additional services category. Examples include Airmen Meteorological Information [AIRMET] and Significant Meteorological Information [SIGMET].)
- On-board weather radar (range 50 to 150 nautical miles [nm] with limited detail)
- Two-way company radios/communications with the AOC/FOC
- Information delivered to commercial aircraft cockpits via data link (e.g., Aircraft Communications Addressing and Reporting Systems [ACARS])
- Information gained by monitoring other pilot-controller communications

Typically, flight crews do not have a complete picture of the NAS environment. Most of the information transferred to the flight deck is via voice communication and often the aircraft must rely on static information provided before departure. This means that general weather forecast information, NAS constraints and in place TMIs can be hours old when the crew reviews them in flight. As a result, without dynamic updates, a flight crew is often unaware of upcoming traffic management programs or delays because of weather.

Old and out of date information in the aircraft leads to uneven knowledge among cockpit crews, traffic management, controllers, and AOC/FOCs. This contributes to inefficient planning, excessive time lapses, a need for additional communication (to compensate for the quality and timeliness of information) and lower flight crew situational awareness levels.

Several constraints hinder the timely flow of useful information to the aircraft. These include:

- Lack of a consolidated data source for all available aviation-related information
- Lack of ground-to-air channel for pilots to obtain shared NAS services and information

- Reliance on voice communications for in-flight aviation
- Limited access to NAS information and services

These constraints adversely affect the timely distribution of NAS information. This reduces the scope of planning and narrows the ability of all users to make dynamic, strategic decisions. The net result is reduced NAS operational agility.

AAtS is the first step in providing on-demand NAS information directly to the flight crew. The expected major NAS operational change under AAtS is the improved common situational awareness, shared with the Air Navigation Service Provider (ANSP) and operation centers throughout the entire flight, resulting from delivery of consistent and timely non-critical operational information to the flight deck. This information access can allow the flight crew to proactively plan for events such as severe convective weather, to ensure the most safe and efficient flight. With AAtS, the flight crew starts to move from being an independent and somewhat isolated sole operator to an engaged, collaborative decision maker.

AAtS will enable the flight crew to shift from current tactical to strategic gate-to-gate management of flight operations. As SWIM adds services, AAtS subscribers will benefit from the enhanced weather, aeronautical, and Traffic Flow Management (TFM) services and associated information.

Access to the full suite of weather data provided by AAtS will give the flight crew the ability to monitor weather system development in real-time and to prepare for weather changes. In addition, accessing TFM data via AAtS may allow the flight crew to learn of planned TMI well before it is implemented. This will give them an opportunity to adjust their plans and mitigate the impacts on their flight. With AAtS, flight crews will not be solely dependent on potentially overloaded service providers to broadcast information that may or may not be helpful, when the flight crew can use it.

Appendix C – AAtS CONUSE Scenarios (Extracted from Appendix E of the AAtS Concept of Use)

Table E.1 - Operational Use Case Scenario 1

Phase of Flight	Without AAtS	With AAtS
	1600Z Flight crew preforms the Clearance Brief	**1600Z** Flight crew preforms the Clearance Brief The flight crew configures the PED to retrieve relevant information for any updates for LAX/JFK or airspace along there route of flight, to deliver weather information/convective forecast updates for the en route airspace along the filed route of flight. This information is received and displayed to the flight crew, which shows favorable weather and winds along the filed route. The flight crew reviews the PED for current departure delays out of LAX and the current operational plan for any potential system impacts en route, delays, and reroutes. The operational plan provides current wind routes for JFK arrival traffic; the flight crew compares these wind routes to the filed route to ensure that the planned route conforms to the wind routes. The flight crew checks for TMIs both current and planned for JFK. The flight crew checks the PED for upper winds information they have received.
	1645Z The flight crew taxis the aircraft for departure after receiving clearance from ATCT.	**1645Z** The flight crew taxis the aircraft for departure after receiving clearance from ATCT.

Phase of Flight	Without AAtS	With AAtS
	Once at the end of the runway, the flight crew contacts the tower for takeoff clearance.	Once at the end of the runway, the flight crew contacts the tower for takeoff clearance.
	1655Z The flight is cleared for takeoff. The aircraft departures and then commences initial climb. After takeoff the tower instructs the flight crew to contact departure control. The flight climbs out and departs LAX terminal airspace without incident. The flight reaches cruising altitude 15 minutes later.	**1655Z** The flight is cleared for takeoff. The aircraft departures and then commences initial climb. After takeoff the tower instructs the flight crew to contact departure control. The flight climbs out and departs LAX terminal airspace without incident. The flight reaches cruising altitude 15 minutes later.
	1835Z The flight encounters moderate turbulence at FL310. Flight crew requests any PIREP information ZDV has for turbulence in the area and if they know of any better rides. ZDV asks ride reports from flights in the sector. includes flights above and below the current altitude. **1852Z** ZDV advises the flight that FL330 has been reported as smooth. The flight crew request FL330. (Not having access to AAtS data required 17 minutes and a number of ATC transmissions to find a better ride.)	**1810Z** The PED notifies the flight crew of recent PIREPS of moderate turbulence along their route at their current altitude entering ZDV. The flight crew enters a request into the PED for turbulence information above and below their current altitude. From this, the flight crew becomes aware of less turbulence at FL330. Given this information, the flight crew request FL330 from ZDV, ZDV assigns the flight FL330
	2035Z	**2000Z** The PEDs indicate the receipt of a recent change to a previously published NOTAM for JFK. The flight crew receives notification

Phase of Flight	Without AAtS	With AAtS
	At 2035Z, the flight crew is advised through ACARS that the NOTAM for JFK has been cancelled The flight crew reviews the ATIS for current weather and runways in use, and brief on their altitude speed, crosswinds, and exits they should expect to take after landing	the NOTAM for JFK has been cancelled and the runway has reopened. The flight crew checks D-ATIS information and plan for descent and arrival into JFK The flight crew also review the D-ATIS for current weather and runways in use, and brief on their altitude speed, crosswinds, and exits they should expect to take after landing
	2045Z The flight crew is unaware of closure to high-speed taxiway Mike Delta has been closed due to a disabled aircraft resulting in up to 15 minute arrival delays into JFK **2120Z** +15 minute arrival delays into JFK, ZNY issues airborne holding with EFC of 2135Z (The flight crew was unaware of the taxiway closure and possible delays and contacts dispatcher to find out the reason for delay and how long it may last). The flight enters holding and the flight crew preforms their Descent/Arrival checklist.	**2045Z** The flight crew is notified through the PED that high-speed taxiway Mike Delta has been closed due to a disabled aircraft resulting in up to 15 minute arrival delays into JFK **2055Z** The flight crew receives notification through their PED of an ATCSCC advisory that high-speed taxiway Mike Delta is closed due to a disabled aircraft. Runway 31L arrival rate is reduced from 32 to 20 due to anticipation of increased spacing on final - expect airborne holding of 15 to 30 minutes. **2120Z** +15 minute arrival delays into JFK, ZNY issues airborne holding with EFC of 2135Z (From the information provided by the PED the flight crew was expecting the delay). The flight enters holding and the flight crew preforms their Descent/Arrival checklist.

Phase of Flight	Without AAtS	With AAtS
	2130Z The flight is cleared out of holding to JFK. **2135Z** The flight crew initiates the descent from cruse altitude into JFK and is instructed contact N90. **2155Z** The flight crew is instructed to contact the tower for landing clearance to Runway 31L **2210Z** The flight lands Runway 31L, nine minutes late, and taxis to the gate.	**2130Z** The flight is cleared out of holding to JFK. **2135Z** The flight crew initiates the descent from cruse altitude into JFK and is instructed contact N90. **2155Z** The flight crew is instructed to contact the tower for landing clearance to Runway 31L **2210Z** The flight lands Runway 31L, nine minutes late, and taxis to the gate.

Table E.2 - Operational Use Case Scenario 2

Phase of Flight	Without AAtS	With AAtS
	1500Z Flight crew performs the Clearance Brief	**1500Z** Flight crew preforms the Clearance Brief Using the PED the flight crew accesses the ORD airport information for updates on deicing times, taxi times and current departure delays. The flight crew also configures the PED to trigger the retrieval of relevant information for any updates for ORD/IAD or airspace along their route of flight

Phase of Flight	Without AAtS	With AAtS
		1505Z The flight crew is notified by the PED of GDP for IAD, the flight crew checks their EDCT of 1700Z and reads ATCSCC advisory for GDP **1515Z** The flight crew configures the PED to deliver 1- hour weather information/turbulence forecast updates for the en route airspace along the filed route of flight Information is received and displayed to the flight crew, which shows favorable weather and wind along the filed route The flight crew enters a request on the PED to retrieve and display information on ORD/IAD, including detailed aeronautical information. The forecast weather events displayed on the PED show significant snow possible for ORD and IAD The flight crew reviews the PED for current departure delays out of ORD and the current operational plan for any potential system impacts en route, delays, and reroutes. The operational plan for IAD has snow removal with runway closures, probable GDP; The crew also checks for TMIs in effect at IAD.
	1525Z The flight crew is contacted by AOC and notified of the IAD GDP advertised and their EDCT is 1700Z **1530Z** The crew contacts AOC to find out what the reason for the	

Phase of Flight	Without AAtS	With AAtS
	GDP is. **1535Z** The Dispatcher contacts the crew and reads ATCSCC advisory to them *1545Z* The FO requests pushback clearance from ramp control. With the APU running, commences deicing. To increase the holdover time, especially at ORD, the Captain elects to start with Type I glycol mix and supplement with Type IV. **1555Z** ORD ATIS - current weather conductions, 600 overcast, visibility two miles, light snow, ORD airport and runway configuration, ORD is conducting snow removal and de-icing. Departing 32 L/R and braking action reported as fair, patchy snow and ice and that runway 28 closed for snow removal.	The flight crew checks the PED for upper winds information they have received. *1545Z* The FO requests pushback clearance from ramp control. With the APU running, commences deicing. To increase the holdover time, especially at ORD, the Captain elects to start with Type I glycol mix and supplement with Type IV. **1550Z** The flight crew, using the PED, checks automated winter forecast display for snow bands moving through the Washington DC area. The two hour forecast displays light to moderate snow at times **1555Z** ORD ATIS - current weather conductions, 600 overcast, visibility two miles, light snow, ORD airport and runway configuration, ORD is conducting snow removal and de-icing. Departing 32 L/R and braking action reported as

Phase of Flight	Without AAtS	With AAtS
		fair, patchy snow and ice and that runway 28 closed for snow removal.
	1645Z With deicing complete, the flight crew request and receives taxi clearance. They taxi as instructed to the assigned runway, contact the tower for takeoff.	**1610Z** Using the PED, flight crew checks current operational plan for IAD, It's reported that there are possible system impacts en route; expecting possible airborne holding due to snow removal and volume. **1645Z** With deicing complete, the flight crew request and receives taxi clearance. They taxi as instructed to the assigned runway, contact the tower for takeoff.
	1700Z Meeting the assigned EDCT, the flight is instructed to position and wait The flight crew receives take off clearance from the tower and they starts their takeoff roll, takes off and begin their initial climb. They reach cruising altitude 15 minutes later.	**1700Z** Meeting the assigned EDCT, the flight is instructed to position and wait The flight crew receives take off clearance from the tower and they starts their takeoff roll, takes off and begin their initial climb. They reach cruising altitude 15 minutes later.
		1730Z Moderate turbulence has been reported at the flight's current altitude along the route. The flight crew receives notification on the PED of PIREPs for light to moderate turbulence along the current route of flight at their altitude. The flight crew checks for

Phase of Flight	Without AAtS	With AAtS
	1800Z The flight encounters turbulence in the area of IIU VOR. The Cabin Crew advises the flight deck that one of the cabin staff hurt their ankle. The captain suspends cabin service, turns on the seat belt sign, and returns everyone to their seat; including the flight attendants. Flight crew contacts ZID requesting PIREPS on turbulence; controller contacts other flights in the area for feedback. The controller asks three flights in the area, and determines that turbulence is at most altitudes. **1840Z** The flight crew has not encountered any more turbulence or heard any additional reports on the frequency so the captain advises the cabin crew and restarts cabin service.	current turbulence PIREPs at alternate altitudes for better ride reports. Current PIREPs indicate that turbulence has been reported at most altitudes, but only a small area around Louisville, KY VOR (IIU). Based on this information the flight crew does not request an altitude change but advises the flight attendants and passengers of possible turbulence. **1800Z** Flight encounters turbulence in the area of IIU. **1805Z** The PED notifies the flight crew of ZDC/PCT airborne holding for IAD +15 minutes now expected to reach +20. The Airport Authority has posted that Runway 1L to close at 1900Z to 2000Z for snow removal. **1840Z** The anticipated area of turbulence materialized, and the flight crew had chose to ride it out for approximately 20 minutes. The flight crew checked real-time updates and

Phase of Flight	Without AAtS	With AAtS
	1850Z Upon contacting ZDC, the controller issues airborne holding at FINKS intersection with an EFC of 1915Z to the flight crew. The flight crew questions the controller about the holding, the cause of it and whether he foresees the EFC being extended. The controller advises the flight crew of the runway closure and that he is not sure how long it will last. **1855Z** The flight crew contacts the AOC on the holding, asks if they know anything more and what they should expect. The AOC contacts the ATCSCC for information on the holding and the ATCSCC contacts ZDC for an update. **1900Z** The flight enters holding and commences their Descent/Arrival checklist items. In additional to the normal checklist items, the flight crew investigates alternative airport information due to lengthy holding and minimum fuel requirements in case a diversion is required.	concluded, after the chop subsided, to return cabin service. The Captain turned off the fasten seat belt sign. **1850Z** Upon contacting ZDC, the controller issues airborne holding at FINKS intersection with an EFC of 1915Z to the flight crew. The flight crew enters the holding and commences their Descent/Arrival checklist. Additional to the normal checklist, the flight crew is investigates alternative airport information due to lengthy holding and minimum fuel requirements in case a diversion is required.

Phase of Flight	Without AAtS	With AAtS
	1910Z The fight crew is advised by AOC that holding is expected to be in the 15 minute range **1915Z** The flight is cleared out of holding and the flight crew continues the route to IAD	**1915Z** The flight is cleared out of holding and the flight crew continues the route to IAD **1920Z** The PED notifies the flight crew that runway 1L will open at 1925Z. **1925Z** Via the PED, the flight crew receives notification that the NOTAM for the IAD runway closure has been canceled and Runway 1L has now reopened.
	1930Z The flight crew contacts PCT and receives the approach procedure and runway to expect.	**1930Z** The flight crew contacts PCT and receives the approach procedure and runway to expect. The flight crew uses the PED to check winter storm forecast to see snow volume and how it may impact visibility at the airport. Additional real-time information that is gathered from the PED including current RVR and braking reports. A recent PIREP from a B757 states braking action for runway 1L is good.
	1955Z The aircraft lands Runway 1L at IAD and taxis to the gate.	**1955Z** The aircraft lands Runway 1L at IAD and taxis to the gate.

Table E.3 - Operational Use Case Scenario 3

Phase of Flight	Without AAtS	With AAtS
	1130Z Flight crew carries out the Clearance Brief The flight crew's weather forecast information is limited to hard copy forecast from the dispatcher based on data more than 2 hours old.	**1130Z** Flight crew carries out the Clearance Brief The flight crew's weather forecast information is limited to hard copy forecast from the dispatcher based on data more than 2 hours old. The flight crew configures the PED to trigger the retrieval of relevant information for any updates for SFO/ORD or airspace along the route of flight. The flight crew configures the PED to deliver weather information/convective forecast updates for the en route airspace along the filed route of flight. The PED displays convective weather possibly impacting ZKC/ZMP arrival routes into ORD. The flight crew enters a request on the PED to retrieve and display information on ORD, including detailed aeronautical information such as approaches. The flight crew reviews the PED for current departure delays out of SFO and the current operational plan for any potential system impacts. The operational plan has probable reroutes for ORD arrival traffic over BDF and JVL 1630Z and later. The flight crew configures the PED to indicate updates to the operational plans for ORD/C90 and ZAU.
	1200Z The FO requests and receives a pushback from ramp control	**1200Z** The FO requests and receives a pushback from ramp control and

Phase of Flight	Without AAtS	With AAtS
	and taxi clearance from SFO ground control, taxis to the departure runway.	taxi clearance from SFO ground control, taxis to the departure runway.
	1230Z Aircraft departs SFO and climbs out, clears tops at 3000 feet. FO passes PIREP to ATC on tops.	**1230Z** Aircraft departs SFO and climbs out, clears tops at 3000 feet. FO enters PIREP in PED on the tops during climb out.
	1300Z Entering ZDV the Flight crew hears questions on turbulence between the ZDV controller and other aircraft. The flight crew asks for a report on the turbulence and is informed that it is at most altitudes. The flight crew advises the cabin of possible turbulence and has the cabin crew stop all services. As the flight crew waits for the controller to get reports in the area, it ties up the frequency and takes time. After 10 minutes ZDV advises the flight crew FL350 reports only light turbulence and ask if they would like higher. The flight crew confirms the request and ZDV clears the flight to FL350. **1315Z** The cabin crew reports to the captain that one passenger and one of the cabin crew were hurt slightly from the turbulence.	**1245Z** Flight crew is notified by the PED of reported turbulence in ZDV airspace. Flight crew checks the reported turbulence and finds turbulence is reported is confined to an area 150 miles ahead at their altitude and below for 100 miles. Reports indicate only light turbulence at FL350 and favorable tail wind that can reduce time enroute by 7 minutes reducing fuel cost. Flight crew request FL350 from ZDV and is cleared to FL350. **1425Z** The flight crew receives notification on the PED indicating a new OPS Plan for ORD due to uncertainty of when convection will start. ZKC and/or ZMP will be the trigger for reroutes if convection impacts arrival routes. The playbook route will be ORD

Phase of Flight	Without AAtS	With AAtS
	1445Z The flight crew is checking their on-board weather radar but with the limited range does not see the area forecasted to develop.	JVL/BDF 2. **1430Z** The flight crew checks the convective forecast for weather development in ZKC/ZMP on the PED. Based on the operational plan the flight crew is looking for the weather development and possible reroute. The display on the PED is showing small areas starting to develop that may impact the routes. **1455Z** Playbook route ORD JVL/BDF 2 has been executed. The flight crew receives notification through their PED of an ATCSCC advisory that the JVL/BDF 2 playbook issued. The flight crew opens the Playbook data information via SWIM link and reviews the route. After this review, they contact dispatch to ensure that they are able to accept the route ONL J114 GEP J106 GRB TVC WYNDE4. The dispatcher advises the flight crew they have the sufficient fuel for the reroute. The flight crew pre-programs the FMS with the route and stores it until it is issued. The flight crew then configures the PED to retrieve the convective weather forecast for ZMP/ZKC. This forecast is displayed and shows convective weather developing in the area of ONL extending south of BDF. **1510Z** PED notifies the flight crew of change to ORD. Flight crew checks the changes; route

Phase of Flight	Without AAtS	With AAtS
	1515Z ZDV clears flight to ORD via direct ONL J114 GEP J106 GRB TVC WYNDE4. The flight crew questions the controller concerning the reason for the reroute. Unsure if they can accept the reroute, the flight crew needs to check with their dispatcher before they can accept route. **1530Z** The flight crew contacts the dispatcher with questions about the reroute. The dispatcher relays information on the reroute and the weather development along the reroute to the flight crew. **1537Z** The dispatcher advises the flight crew they can accept the reroute and that their fuel load is sufficient. **1542Z** The flight Crew advises ZDV that they can accept the reroute. Due to the delay in accepting the reroute, the flight will take an additional 17 minutes longer and require approximately 800 pounds of additional fuel. The total cost of the reroute 27 minutes and	advisory for ORD has been published. Flight crew can expect ONL J114 GEP J106 GRB TVC WYNDE4 reroute, based on planning with the dispatcher from the ATCSCC advisories; flight crew can accept the route. This will add 20 minutes of flying time and consume approximately 920 pounds of fuel. **1515Z** ZDV clears the flight to ORD via direct ONL J114 GEP J106 GRB TVC WYNDE4. The flight crew accepts the clearance and programs the FMS. They then check the PED for weather and flight conditions along the reroute. **1535Z** The dispatcher has checked all passenger connections and relays this to the flight crew. The late arrival will not impact the connections.

Phase of Flight	Without AAtS	With AAtS
	1720 pounds of fuel, compared to AAtS flight's 10 minutes and 920 pounds of fuel, due to the altitude change earlier and pre-coordination on the reroute from the heads up from PED. **1550Z** The flight crew requests an updated weather forecast along the new route of flight. The hard copy forecast provided to the flight crew with the dispatcher release is over six hours old not giving the flight crew current conditions. **1558Z** The dispatcher sends the flight crew an updated forecast, not expecting any weather along route. **1600Z** The dispatcher advises the flight crew the flight is going to be approximately 40 minutes late and passes along gate information for passengers with connections.	**1605Z** No convective weather but turbulence exists along the new route. Flight crew receives notification on the PED of turbulence along the new route. Upon review, it shows that for the remainder of the flight the aircraft will be experiencing turbulence. Before encountering turbulence, the flight crew instructs the cabin crew to cease cabin service and for everyone to remain seated for the remainder of flight.
	1700Z The flight crew preforms their Descent/Arrival checklist. The flight crew initiates the descent from cruse altitude into	**1640Z** The flight crew commences their Descent/Arrival checklist items. The flight crew initiates the descent from cruse altitude into ORD.

Phase of Flight	Without AAtS	With AAtS
	ORD.	
	1720Z The flight lands, +20 minutes late and taxis to the still open gate.	**1700Z** The flight lands and taxis to the still open gate.

Table E.4 - Operational Use Case Scenario 4

Phase of Flight	Without AAtS	With AAtS
	1250Z Flight crew preforms the Clearance Brief	**1250Z** Flight crew preforms the Clearance Brief The flight crew configures the PED device to trigger the retrieval of any updates for IND and enters a request via the PED for forecast weather that may affect the planned route and requested altitude. The meteorological information is tailored to the flight trajectory and flight times and information is received and displayed to the flight crew showing favorable weather and winds along the filed route within the specific times, IFR weather in the IND area may impact all the airports later. The flight crew then requests the PED to retrieve and display detailed aeronautical information for IND including NOTAMs and instrument approaches. The flight crew proceeds to review the PED for current

Phase of Flight	Without AAtS	With AAtS
		departure delays out of C90 and the current operational plan for any potential system impacts en route, delays, and reroutes and checks for TMIs in effect at IND.
	1345Z The FO contacts ground control for taxi clearance, taxis to the departure runway and switches the frequency to Tower (ATCT) for takeoff clearance.	**1345Z** The FO contacts ground control for taxi clearance, taxis to the departure runway and switches the frequency to Tower (ATCT) for takeoff clearance.
	1355Z The flight is cleared for takeoff, the aircraft rolls down the departure runway and commences initial climb. Tower instructs the flight crew to contact Chicago departure control (C90); the aircraft departs C90 terminal airspace without incident and reaches cruising altitude 15 minutes later.	**1355Z** The flight is cleared for takeoff, the aircraft rolls down the departure runway and commences initial climb. Tower instructs the flight crew to contact Chicago departure control (C90); the aircraft departs C90 terminal airspace without incident and reaches cruising altitude 15 minutes later.
	1410Z The fight crew is issued holding EFC 1500Z Flight crew starts looking at their time schedule. They have 60 minutes to do a quick turn to get back to RFD for the second group. Due to	**1405Z** PED notifies the flight crew of the airborne holding into IND; expected to be 15 to 20 minutes. The flight crew starts looking at their time schedule; they have 60 minutes to do a quick turn to get back to RFD for the second group. Holding up to 30 minutes will still allow the flight crew to make RFD in time for the return flight. **1410Z** The flight crew is issued holding instructions with an EFC of 1500Z

Phase of Flight	Without AAtS	With AAtS
	the schedule, the flight crew talks with the passengers and change their destination to EYE. The flight crew cannot accept airborne holding of 60 minutes and makes the decision to change and land at Eagle Creek, (EYE). The flight crew is re-cleared to EYE. The FO is coordinating with limo service to move from IND to EYE to pick up passengers, also needs to amend flight plan to depart EYE and not IND.	**1425Z** The flight crew is cleared out of holding and continues to IND **1445Z** Update on the PED current airborne holding is only going to be +20; also because of reduced AAR the ATCSCC is planning to G/S into a GAAP program for IND
	1455Z The flight crew commences their Descent/Arrival checklist items.	
	1455Z The flight lands at EYE, passengers have LIMO to IND to meet customers at FBO will be late for meeting **1530Z** The flight crew has landed at EYE limo is not at the airport. The flight crew is waiting for limo the passengers are still on the aircraft.	**1510Z** The flight crew is cleared out of holding and continues to IND The flight crew commences their Descent/Arrival checklist items. **1540Z** The flight lands at IND without problem. The limo is waiting for the passengers at the FBO.
	1545Z The flight crew contacts their flight planning service to change their flight plan from departing IND to depart EYE landing RFD	**1545Z** The flight crew reviews PED for current weather, TMIs and the Super Bowl status board for

Phase of Flight	Without AAtS	With AAtS
	The flight crew contacts FSS for a weather briefing and an update on current TMIs	IND updates
	1600Z FO contacts IND TRACON to request departure clearance; flight crew is given the clearance but told to hold for release for traffic – expect a 15 minute delay.	**1600Z** The flight crew is notified by PED that a GAAP program for IND expected to be out about 1615Z FO contacts Ground Control (GC) for taxi.
	1615Z The flight is released from EYE, clearance void at 1630z.	**1615Z** The flight is cleared for takeoff.

Appendix D – Acronyms

AAtS	Aircraft Access to SWIM
AIXM	Aeronautical Information Exchange Model
ACARS	Aircraft Communications Addressing and Reporting Systems
ADS-B	Automatic Dependent Surveillance – Broadcast
AIRMET	Airmen Meteorological Information
ANSP	Air Navigation Service Provider
AOC/FOC	Aircraft Operations Centers and Flight Operations Centers
ARTCC	Air Traffic Control Center
ASDI	Aircraft Situation Display to Industry
ASIAS	Aviation Safety Information and Sharing System
ATM	Air Traffic Management
CDM	Collaborative Decision Making
CIWS	Corridor Integrated Weather System
CONUSE	Concept of Use
Data Comm	Data Communication
DHS	Department of Homeland Security
DMS	Data Management System
ERAM	En Route Automation Modernization
ITWS	Integrated Terminal Weather System
FAA	Federal Aviation Administration
FIXM	Flight Information Exchange Model

FMS	Flight Management System
GA	General Aviation
GPWS	Ground Proximity Warning System
NAVAID	Navigational Aid
NAS	National Airspace System
NESG	NAS Enterprise Security Gateway
NextGen	Next Generation Air Transportation System
NOTAM	Notices to Airmen
NTML	National Traffic Management Log
OIS	Operational Information System
OPSNET	Operations Network
OPS Plan	Operations Plan
ORD	Chicago O'Hare International Airport
SAA	Special Activity Airspace
SIGMET	Significant Meteorological Information
SLA	Service Level Agreement
SOA	Service-Oriented Architecture
SWIM	System Wide Information Management
TCA	Tactical Customer Advocate
TFM	Traffic Flow Management
TMI	Traffic Management Initiative
TFR	Temporary Flight Restriction